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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/801,655	03/09/2001	Stephen Buchwalter	YOR920000330US1	3955

7590 08/27/2002

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EXAMINER

THAI, LUAN C

ART UNIT	PAPER NUMBER
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2827

DATE MAILED: 08/27/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/801,655

Applicant(s)

BUCHWALTER ET AL.

Examiner

Luan Thai

Art Unit

2827

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 June 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) 16-27 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 28-35 is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

This Office action is responsive to the amendment filed June 13, 2002.

Claims **1-35** are pending in this application.

Claims **16-27** are withdrawn from consideration as being directed to non-elected invention.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-5, 8, 10, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins (5,468,995) in combination with Ardakani et al. (5,512,613 of record) (as set forth in the previous Office Action paper Number 8 and now repeated).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 1-5, 8, 10, and 13, Higgins (specifically see figures 1 and 6) a packaging structure comprising a semiconductor device 22 (22') bonded to a chip carrier 12 (12') with an adhesive 24 (44), wherein the semiconductor is electrically connected to the chip carrier (12) with wire-bonds 26 (see figure 1) or the semiconductor device is a flip chip electrically connected to chip carrier 12' with solder ball 42 (see figure 6). Higgins fails to teach the adhesive comprising

Art Unit: 2827

a cured reaction product from a diepoxide and cyclic anhydride wherein the epoxy groups are connected through an acyclic acetal moiety and a thermal conductive filler.

Ardakani et al. teach Cycloaliphatic epoxides, which are reworkable and are a class of epoxy resins, comprising a cured reaction product from a diepoxide and cyclic anhydride wherein the epoxy groups are connected through an acyclic acetal moiety, wherein the diepoxide is acetaldehyde bis-(3,4-epoxycyclohexylmethyl) acetal (Col. 6, lines 14+); a thermally conductive filler such as alumina, silica (e.g., thixotropic agent), zinc oxide, etc. (Col. 6, lines 52+). The diepoxides above are of great importance for a number of diverse applications including coatings, structural components, adhesives, encapsulants, etc. (Col. 1, lines 10-25). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the adhesives as taught by Ardakani et al. to Higgins' structure device in order to have the adhesive to be removed for repair, replacement, recovery, etc. (Col. 1, lines 17+).

Regarding claim 12, since the adhesive disclosed by Ardakani et al. (as discussed above) and that of applicant claimed are similar, it would be obvious for the adhesive disclosed by Ardakani et al. to include the claimed characteristic of providing a void-free bond.

3. Claims 6-7 and 9, insofar as in compliance with 35 USC 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins (5,468,995) in combination with

Ardakani et al. (5,512,613 of record) and further in view of Takigawa et al. (5,844,309) (as set forth in the previous Office Action paper Number 8 and now repeated).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 6-7 and 9, the proposed device of Higgins and Ardakani et al. discloses all the limitations of the claimed invention as detailed above with the exception of the filler being selected from the group consisting of aluminum nitride, silver flake, and silica-coated aluminum nitride (regarding claims 6-7) or the filler being electrically conductive (regarding claim 9).

Takigawa et al. while related to a similar adhesive composition design teach the filler, added to an adhesive, including: insulating fillers such as silica, aluminum nitride, alumina, boron nitride, etc. and conductive fillers made of silver, gold, copper, aluminum, etc. (Col. 30, lines 4+). It would have been obvious to one of ordinary skill in the art at the time the invention was made to use aluminum nitride filler or electrically conductive fillers added to the adhesive composition of the proposed device of Higgins and Ardakani et al. since such application is conventional in semiconductor art as taught by Takigawa et al.

4. Claims 14-15, insofar as in compliance with 35 USC 112, are rejected under 35 U.S.C. 103(a) as being unpatentable over Higgins (5,468,995) in combination with Ardakani et al. (5,512,613 of record) and further in view of Call et al. (5,471,027) (as set forth in the previous Office Action paper Number 8 and now repeated).

The figures and reference numbers referred to in this office action are used merely to indicate an example of a specific teaching and are not to be taken as limiting.

Regarding claims 14-15, the proposed device of Higgins and Ardakani et al. discloses all the limitations of the claimed invention including an under fill encapsulant 44 (see Higgins' figure 6), as detailed above, with the exception of a heat spreader being bonded to the semiconductor device.

Call et al. (see figures 1-2 and 4-6) while related to a similar flip chip bonding design teach a heat spreader (10-70-170) being bonded to a flip chip (20) for dissipating heat generated from the semiconductor device. It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply Call et al.'s teachings of heat spreader to the proposed device of Higgins and Ardakani et al. for dissipating heat generated from the semiconductor device.

5. The following reference(s) was cited as of interest to this application:

U.S. Pat. No. 6,214,460 to Bluem et al. (Col. 8, lines 65-66) is/are cited for teaching silica is a thixotropic agent.

Allowable Subject Matter

6. Claims 28-35 are allowed.

7. The following is an examiner's statement of reasons for allowance: Claims 28-35 are allowable over the prior art of record because none of the prior art whether taken singularly or in combination, especially when these limitations are considered within the

Art Unit: 2827

specific combination claimed, to teach: a reworkable thermally conductive adhesive composition comprising: a) about 20 to about 60% by weight of a cured reaction product from diepoxide and a cyclic anhydride wherein the epoxy groups are connected through an acyclic acetal moiety; b) about 40 to about 79% by weight of a thermally conductive filler; c) about 0.05 to about 2% by weight of a thixotropic agent based upon the total a), b), and c) in the composition.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Response to Arguments

8. Applicant's arguments filed on June 13, 2002 have been fully considered but they are not persuasive.

Specifically, in response to applicant's argument (in page 2, paragraphs 3-4, of the Remarks) that there is no suggestion to combine the references, Higgins (995) and Ardakani et al (613), the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992).

Applicant argues (in page 3, the third, fourth, and fifth paragraphs, of the Remarks) that Higgins (995) fails to teach the adhesive being produced from a diepoxide and cyclic anhydride, connected through an acyclic acetal moiety, and Ardakani et al. (613), although disclose the claimed adhesive produced from a diepoxide and cyclic anhydride and mixed with a filler but fail to suggest that the adhesive material *"could be used in the type of structure required by the present invention to achieve a void-free thin-bond line between the chip and the chip carrier"*. In addition, Ardakani et al. (613) teach the claimed filler (e.g. silica) but Ardakani et al. fail to disclose the filler must be thermally conductive as required by the present invention.

In response, it is noted that the limitation of *"the adhesive material could be used in the type of structure required by the present invention to achieve a void-free thin-bond line between the chip and the chip carrier"* is not recited in the claimed structure of claims 1-5, 8, 10, and 13. Moreover, Higgins (995) does disclose the claimed device structure including an adhesive for bonding a semiconductor device to a chip carrier but fails to teach the adhesive material, particularly. Furthermore, Ardakani et al. (613), the secondary reference, teaches the claimed epoxy compositions (as described above) which are widely used in microelectronic applications as an adhesive allowed to be removed for repair, replacement, recovery, or recycling of the article of which the material is a part (Col. 1, lines 10). Furthermore, Ardakani et al. (613) disclose the adhesive comprising silica filler, which appears to be a thermally conductive filler, as

claimed. In addition, since the adhesive disclosed by Ardakani et al and that of applicant claimed are similar, it would be obvious for the adhesive disclosed by Ardakani et al. to include the claimed characteristic of "providing a void-free bond". Thus, Applicant's arguments with respect to claims 1-5, 8, 10, 12, and 13 are not persuasive and the rejection of these claims under 35 U.S.C. 103(a) as being unpatentable over Higgins (5,468,995) in combination with Ardakani et al. (5,512,613) is proper.

Applicant argues (in page 4, paragraphs 2-3-4-5, of the Remarks) that the rejections of claims 6, 7, 9, and 14-15 are improper since the generic claims are patentable. In response, the examiner confirms that the rejections of claims 6, 7, 9, and 14-15 over the cited references are proper because the generic claims are not patentable, as discussed above.

In response to applicant's argument (in page 4, the last paragraph, and page 5, of the Remarks) that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Conclusion

9. Applicant's amendment filed on June 13, 2002 has been fully considered but they are not persuasive. Therefore, **THIS ACTION IS MADE FINAL**. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

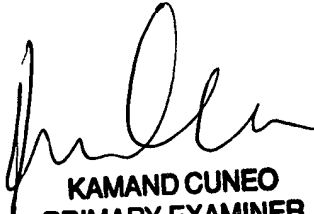
10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luan Thai whose telephone number is (703) 308-1211. The examiner can normally be reached on 7:00 AM - 4:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David L. Talbott can be reached on (703) 305-9883. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Art Unit: 2827

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Luan Thai
August 23, 2002



KAMAND CUNEO
PRIMARY EXAMINER